Effect of simulated microgravity on the filamentous fungus Aspergillus niger

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Abstract

Fungi are able to colonize indoor-closed habitats such as space stations, and grow in a variety of solid and liquid substrates – e.g. walls, windows, life-support systems, etc. Their growth is usually associated with material degradation and spore formation, which can pose a threat to both astronauts' health and spacecraft safety, in particular when in long-duration missions [1-3]. This makes monitoring fungal populations a challenge for medical and operation requirements in current and future space missions. *Aspergillus niger* is one of the predominant fungus detected aboard the Russian Space Station (Mir) as well as the International Space Station (ISS), but it is also exploited as important cell factory for the production of proteins, enzymes, organic acids and bioactive substances [4]. Understanding how space environment affects fungal growth is not only important to maintain health and safety in spacecraft habitats, but also to assess future opportunities for biotechnology in space.

To study how microgravity affects the growth of *A. niger*, an approach was followed to characterize its cellular structures under simulated microgravity. For that, *A. niger* was grown as a colony for 3-5 days in minimum medium at 30∘C, in both Earth gravity (1 g) and simulated microgravity (SMG) using a Clinostat [4]. Three different mutant strains were included, to study the importance of melanin in adapting to the simulated microgravity environment and its effect on hyphal tip growth. Growth and sporulation were determined, and colony microstructure was analyzed by scanning electron microscopy [5]. The data obtained suggest that simulated microgravity induces changes in colony thickness, colony area and sporulation yield and imply that melanin plays a role in adapting to the low gravity environment.

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